interior of Canada, and Dr. Helm brought forward some new observations on the migration of the starling in Germany.

The third section, for biology, nidification and oology, was presided over by Dr. Victor Fatio, of Geneva, and received communications from the Rev. C. R. Jourdain on erythrism in eggs, and from Dr. R. Blasius on the bird-life of the Pyrenees. In this section also, Mr. Frank M. Chapman, of New York, delighted his audience by his vivid description of the breeding-places of the scarlet flamingo and brown pelican in the Bahamas, which he had lately visited, and by his excellent photographic illustrations of these birds and their nests.

Mr. H. E. Dresser took the presidential chair in the fourth section, which was devoted to economic ornithology and the protection of birds, and was well attended. Papers were read here by Dr. Herman on his recent observations on the constituents of the food of birds, by Sir John Cockburn on the legislation that had taken place in Australia for the preservation of bird-life, and by Mr. T. Digby-Pigott on the present state of the laws on the same subject in Great Britain and Ireland, which seem to require careful revision. Mr. Frank E. Lemon, secretary of the Royal Society for the Protection of Birds, also lectured on the same subject.

In section five (aviculture) the communications were not so numerous, but Mr. D. Seth-Smith, the editor of the *Avicultural Journal,* did not omit to urge the importance of his special branch of ornithology as an aid to scientific study, which, indeed, is now generally admitted.

Besides the sections, general meetings were held on the Wednesday and Friday, at which various ornithological topics of general interest were discussed. Papers were read by Dr. Paul Leverkühn, of Sophia, on the breeding-places of the vultures and eagles in the Balkans, by Dr. Herman on the state of ornithology in Hungary and on the theory of the migration of birds and its origin, and by Mr. J. L. Bonhote on the hybridisation of ducks; while Mr. W. S. Bruce gave an interesting account of the ornithological results of the Scottish Antarctic Expedition which are now being worked out. Besides these papers, Dr. Edward Wilson gave an excellent lecture on the birds obtained and observed in the Antarctic seas and lands during the recent National Antarctic Expedition, and showed off the manners and customs of the penguins in a long series of photographs.

Thursday, June 15, was entirely devoted to a visit to the great zoological museum at Tring, of which the birds (under the curatorship of Dr. Hartert) form one of the most prominent features. It is needless to say that the ornithologists were most hospitably received and entertained by Mr. Walter Rothschild, who further delighted the visitors by a lecture on birds extinct or likely soon to become so, one of his pet subjects of study. This lecture was illustrated by the exhibition of a splendid series of specimens of the birds in question, for which the Tring Museum is celebrated, and by numerous drawings collected from every quarter whence information on this subject could be obtained.

At the final meeting, held on Saturday, June 17, it was agreed that the next assemblage of the International Ornithological Congress should take place in 1910 in Germany, with Dr. Reichenow, of Berlin, as president, and Dr. R. Blasius and Graf Hans von Berlepsch as vice-presidents. It was hoped that the meeting would be held at Berlin, but the president and vice-presidents were authorised to select any other city in Germany as the place of assemblage in case they should find it more expedient to do so. It was also agreed, on the motion of Mr. Walter Rothschild, to send telegrams to the Governments of Tasmania and New Zealand requesting them to interfere with the destruction of the penguins in the Antarctic islands now carried on in order to obtain the small quantity of oil which is contained in the bodies of these unfortunate birds.

THE THAMES FLOW AND BRITISH PRESSURE AND RAINFALL CHANGES.

During the years 1903 and 1904 there appeared two reports dealing with the flow of the Thames in relation to the rainfall of the river's basin, the first being published by the London County Council and the second by the Thames Conservators. The material dealt with extended over the period 1883 to 1903, and the very close association between rainfall and flow was clearly brought out.

In a recent communication to the Royal Society by Sir Norman Lockyer and the writer, an attempt has been made to discuss data from the year 1860 up to the present time, involving not only statistics of rainfall over a wider area than that dealt with in the above mentioned inquiries, but changes of barometric pressure in Great Britain and certain distant areas.

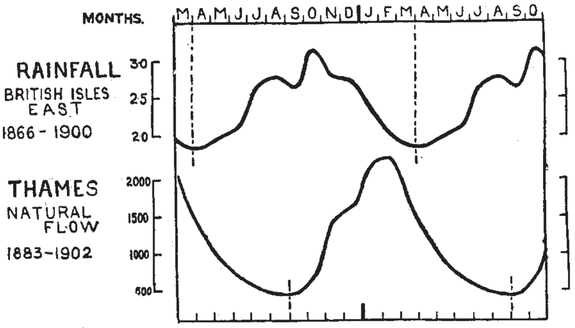

Fig. 1.—The curve representing the mean annual variation of the Thames flow lags five months behind that of the mean annual rainfall of the British Isles.

In consequence of the fact that the British annual variation of rainfall is at a minimum in about April and a maximum in about October, the rainfall observations have been grouped into twelve months extending from April to the following March, both months inclusive. The annual variation of the river flow (see Fig. 1) for similar reasons necessitated a different grouping of the twelve months; in this case the year was taken to cover the period September to the following August, both months inclusive. The flow of the river will thus be seen to lag five months behind the rainfall.

In the following curves here reproduced the rainfall for each group of twelve months (April to March) is compared directly with the river flow for the twelve months commencing in September of the same year.

Re-computing the rainfall and river statistics, published in the above mentioned reports, according to these new divisions of the year, the changes from year to year can be seen in Fig. 2 (curves iii. and iv. continuous lines). To investigate variation in the river flow previous to 1883, an application to the Thames Conservators resulted in securing original data which have enabled the curve to be traced back to the year 1860 (Fig. 2, curve iii., dotted portion). As a check on the whole of this curve another series of gauge readings was similarly treated, and these are shown in curve ii. The synchronous variations in the two curves thus indicate that either curve may be taken to represent the flow changes.

In the above mentioned reports the curve representing the rainfall of the river basin from 1883 (curve iv.) was deduced from the statistics of twelve stations covering a comparatively small area. It happens, however, that these rainfall variations in this valley are not restricted to this region alone, but are similar to those which occur over a very large area in the British Isles. By employing the Meteorological Office records, and computing them according to the present adopted system of grouping of months, curves can be obtained which commence in the year 1866. Investigation has shown that this type of variation is nearly common to England S., Midland Counties, and even the combination of Scotland E., England N.E. and E., and the Midlands, as can be gathered from the curves in Fig. 2 (curves v., vi., vii.).

The other districts in the British Isles (with the exception of Scotland N., which is different from all other districts in these isles) are of a type similar to each other, but present variations which, although not widely different from the eastern and other districts, are sufficiently unlike them to be classified apart.

The rainfall of the British Isles is produced mainly by the passage of areas of low pressure travelling over the country in a north-easterly or easterly direction. It should therefore be expected that on the average the greater the rainfall the more numerous the cyclones, and consequently the lower the mean value of pressure. In the United Kingdom, therefore, the rainfall variations from year to year should correspond very closely with the *inverted* pressure changes. That this is so can be seen by comparing the *inverted* Oxford pressure curve in Fig. 2 (curve viii.) with the rainfall curves underneath. Instead of Oxford, any other town in the United Kingdom, such as Armagh, might have been taken (curve ix.), for the pressure changes are so remarkably similar over a very wide area.

It will thus be seen that the pressure, rainfall, and river flow are all intimately related, and any method of forecasting pressure would make it possible to determine beforehand the rainfall. Since the Thames flow has a lag of five months on both rainfall and pressure, a means is possibly available of stating the "expectancy" of excessive or deficient amount of water in the river.

It may here be pointed out that it does not seem necessary to collect and discuss the data over the whole of this region before any deduction *for practical purposes* can be made regarding the flow of the Thames. The barometric and rainfall observations made at the Radcliffe Observatory, Oxford, exhibit variations from 1860 up to the present time so very similar to those of the Thames flow that all three curves are very nearly interchangeable.

So striking is the agreement that they are here reproduced (Fig. 3).

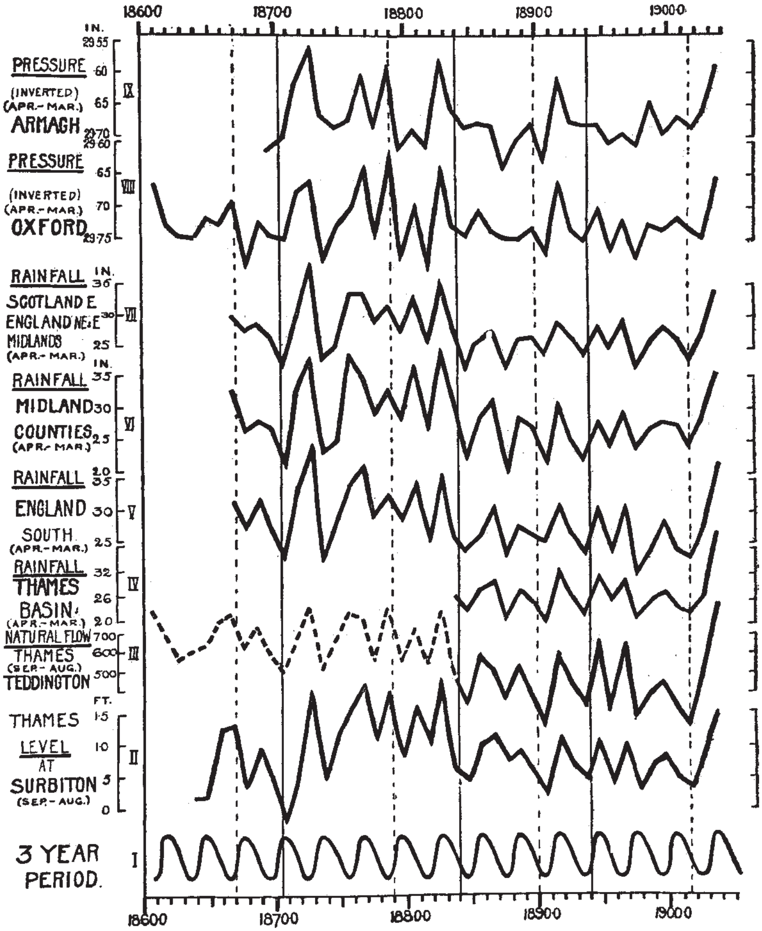

FIG. 2.—Curves illustrating the similarity between the Thames flow, and rainfall and pressure (curves inverted) in the British Isles. [The continuous and dotted vertical lines represent the epochs of sun-spot maxima and minima respectively.]

The question now arises, can British pressure be forecasted?

It has been previously pointed out in this Journal (vol. lxx. p. 177, June, 1904) that there exists a world-wide barometric see-saw between two nearly antipodal parts of the earth, the one region about India and its neighbourhood behaving in an *inverse* way to that of South America and the southern parts of the United States. In some regions, and the British Isles was one of them, the pressure variation curves were found to be a distinct mixture of both the Indian and South American types, and it was difficult to classify them.

To illustrate this, the accompanying figure is given (Fig. 4). The upper curve represents an hypothetical curve with a period of 3.8 years, and beneath it the South American (Cordoba) pressure curve. At the very bottom is given the *inverse* of this hypothetical curve, and above this the Indian (Bombay) curve. Between the Bombay and the Cordoba curves is given that of Oxford. It will be noted that the Cordoba curve disagrees with its hypothetical curve in the years 1892 and 1900 to 1903, while the Bombay curve shows anomalies in 1892 and 1901 to 1903.

If, now, the Oxford pressure be compared with those of Cordoba and India, and a list made showing the years in which high pressure at Oxford coincides with years of high pressure at Cordoba or India, or low pressure at Oxford with low pressure at Cordoba or India, the following table is the result (omitting average conditions):—

Agreement between Oxford and	Years of simultaneous excess	
	High pressure	Low pressure
Cordoba	1874	—
,,	1875	—
,,	—	1877
India	—	1878
,,	1880	—
,,	—	1882
,,	1884	—
,,	—	1886
Cordoba	1893	—
,,	—	1895
India	1896	—
,,	1899	—

It will be seen that there is a very even balancing between Cordoba and India. A most interesting point is that the Oxford curve seems to favour for series of years the two main pressure types alternately. From 1900 the type of variation seems somewhat indefinite.

This table seems to suggest that during some years the British area is enveloped in the pressure system that extends over the large region in which India is about the centre, while for another series it is dominated by the antipodal pressure system of which South America is the middle portion.

It is possible that it is this alternate reversion from one type to the other that prevents the 3·8-year change of the Indian and Cordoba curves from occurring in the British curves, and substitutes for it an apparent shorter period of about three years, which is very noticeable for some series of years in the British curves (Fig. 2, curve i.).

It will thus be seen that it is difficult at present to forecast British pressure correctly, but further research will very probably render it possible when more is known about the mechanism of the atmosphere.

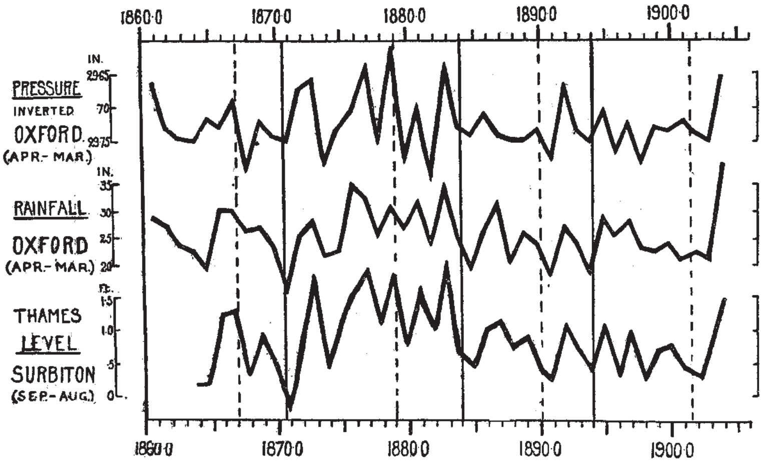

FIG. 3.—Curves to show the similarity between the flow of the Thames and the rainfall and pressure (inverted) changes at one station, namely, Oxford.

In conclusion, it is interesting to note that in addition to this short period variation the curves (Fig. 2) indicate one of longer duration. An examination of these statistics, when the curves are smoothed by taking three-year means to eliminate the short period changes, shows that when the river flow was greatest, *i.e.* between about the years 1873–1883, the rainfall was highest and the pressure lowest, which is exactly what was to be expected from the relationship between pressure, rainfall, and river flow in these islands. Another point here indicated is that this long period change is real, and that there is a tendency now for the low river levels, deficiency of rainfall, and excess pressure of the last decade or more to be replaced by a greater mean flow of the river, increase in the rainfall, and a diminution in the barometric pressure. WILLIAM J. S. LOCKYER.

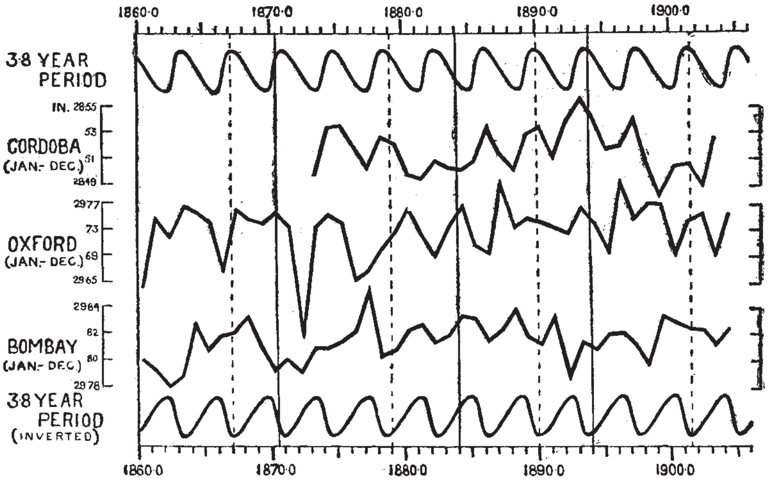

FIG. 4.—Curve to illustrate the relation between the British (Oxford) pressure change and those of India (Bombay) and S. America (Cordoba).

NOTES.

A ROYAL garden party was held on Wednesday, June 14, and was attended by about six thousand guests. At the end of the official record of notable people present, supplied to the *Times* by the "Court Newsman," we read:—"Invitations were issued to their Excellencies the Foreign Ambassadors and Ministers, with the *personnel* of their Embassies and Legations, the members of the Government, the Households of the King and Queen and of the Royal Family, and to many peers, members of Parliament, naval and military officers, clergy, and representatives of the musical, dramatic, and literary professions, many of whom with their wives and daughters were present at the party." We believe His Majesty the King is interested in the scientific as in the other activities of his subjects; but if so, it is clear that he is very badly served by the Lord Chamberlain's office, which is responsible for the issue of the invitations. Apparently, this department of the State has not yet realised that science is the only true basis of a nation's welfare and progress, and that scientific men exist in Britain. A few of the most distinguished Fellows of the Royal Society would represent the best interests of the nation even more effectively than actors and musicians.

THE Royal Society's annual conversazione, to which ladies are invited, will take place on Friday, June 23.